

WHAT IS CLAIMED IS:

1. Analysis apparatus for analyzing the skin, the apparatus comprising:

5 an ultrasound probe arranged to analyze the skin along an axis; and

a vibrator arranged to emit at least one shear wave to a region of the skin extending about the axis, wherein the ultrasound probe is arranged to detect a displacement induced in the skin by propagation of the shear wave.

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2. Apparatus according to claim 1, including a coupling member enabling ultrasound waves to be transmitted between the probe and the skin.

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3. Apparatus according to claim 2, wherein a thickness of the coupling member enables the ultrasound waves to be focused in a given region of maximum depth below a surface of the skin.

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4. Apparatus according to claim 3, wherein the depth of said region is less than or equal to 4 mm.

5. Apparatus according to claim 1, wherein a focal length of the ultrasound probe lies in the range 10.4 mm to 15.6 mm.

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6. Apparatus according to claim 2, wherein a thickness of the coupling member lies in the range 10.6 mm to 14.4 mm.

7. Apparatus according to claim 2, wherein the coupling member is in the form of a disk of viscoelastic material.

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8. Apparatus according to claim 7, wherein the coupling member is held against a surface of the skin by a holding

ring provided with an inwardly-directed rim against which a face of the coupling member remote from the skin can bear.

9. Apparatus according to claim 8, including a frame to which the vibrator and the probe are secured, wherein the frame enables the apparatus to be positioned so that the axis is substantially perpendicular to a surface of the skin.
10. Apparatus according to claim 1, wherein said vibrator includes an annular piece defining a contact surface from which the shear wave is emitted to the skin, the annular piece presenting a central bore in which the ultrasound probe extends.
11. Apparatus according to claim 10, wherein the contact surface presents symmetry about the axis.
12. Apparatus according to claim 10, wherein the contact surface presents circular symmetry about the axis.
13. Apparatus according to claim 1, wherein the probe is arranged to emit and receive ultrasound waves at a frequency lying in the range of 1 MHz to 300 MHz.
14. Apparatus according to claim 1, wherein the probe is arranged to emit and receive ultrasound waves at a frequency lying in the range of 30 MHz to 70 MHz.
15. Apparatus according to claim 1, wherein the probe is arranged to emit and receive ultrasound waves at a frequency of 50 MHz.

16. Apparatus according to claim 1, including a generator arranged to deliver a low-frequency signal to the vibrator during the entire analysis period, the signal having a frequency lying in the range of 100 Hz to 500 Hz.

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17. Apparatus according to claim 1, including a generator arranged to deliver a low-frequency signal to the vibrator during the entire analysis period, the signal having a frequency of about 300 Hz.

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18. Apparatus according to claim 1, including a processor device arranged to deliver at least one piece of information from signals picked up by the ultrasound probe, wherein the information represents a mechanical property and/or a thickness of at least one layer of the skin.

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19. Apparatus according to claim 18, wherein the processor device is arranged to deliver information relating to a state of the skin, by comparing a measured value with a reference value.

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20. Apparatus according to claim 19, wherein said state of the skin is its degree of aging.

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21. Apparatus according to claim 18, wherein the processor device is arranged to store the signals picked up by the ultrasound probe at various successive time points.

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22. Apparatus according to claim 18, wherein the processor device is arranged to store the signals picked up by the ultrasound probe all n time intervals dt , n lying in the range of 50 to 500.

23. Apparatus according to claim 22, wherein dt lies in the range of 2.2 ms to 0.8 ms.

24. Apparatus according to claim 1, wherein the probe and the vibrator are arranged so that the displacement of the vibrator for generating the shear wave is not transmitted to the probe.

25. A skin analysis method, comprising analyzing skin by means of the apparatus according to claim 1.

26. A method according to claim 25, further comprising the step of processing signals coming from the ultrasound probe so as to determine at least one value relating to a mechanical property of the skin.

27. A method according to claim 26, wherein said mechanical property is selected from the group consisting of its Young's modulus, its shear modulus, and the propagation speed of the shear wave.

28. A method according to claim 26, wherein the phase lag of the shear wave is calculated as a function of the depth.

29. A method according to claim 26, wherein a state of the skin is determined by comparing a value for Young's modulus resulting from analyzing the skin with reference values.

30. A method according to claim 29, wherein said state of the skin is a degree of aging of the skin.

31. A method of evaluating a mechanical property of a region of the skin, the method comprising:

analyzing said region with the apparatus according to claim 1; and

delivering, from the results of the analysis, information relating to said mechanical property.

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32. A method of determining the effectiveness of treatment that has action on a mechanical property of the skin, the method comprising:

performing a first evaluation of said mechanical property;

performing the treatment; and

after the treatment, performing a second evaluation of said mechanical property, at least one of the first and second evaluations being performed by implementing the method according to claim 26.

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33. A method of treating a region of a human body, the method comprising:

evaluating a mechanical property of the skin in said region by implementing the method according to claim 31; and performing treatment that has action on said property in the light of the result of the evaluation.

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34. A method of promoting the sale of a product, the method including demonstrating activity or effectiveness of the product as revealed by the method of claim 32.

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